2003
Fire Weather Forecasting Services
for
North Dakota

Introduction
This Annual Operating plan is a procedural guide, based on the National Interagency Agreement for Meteorological Services, which describes fire meteorological services provided within North Dakota.

Service Area and Organizational Directory
The National Weather Service Office in Bismarck (WFO BIS) is responsible for the fire weather program in central and western North Dakota (Fire Weather zone 134). The National Weather Service Office in Grand Forks (WFO FGF) is responsible for eastern North Dakota (Fire Weather zone 135). See Figure 1. Points of contact can be found starting on page 4. The normal fire weather season begins in early April and continues to around the middle of October - but will vary according to the actual weather. Fire weather forecasts and other fire weather related information can be found on the Bismarck and Grand Forks Internet web pages: http://www.crh.noaa.gov/bis/ or http://www.crh.noaa.gov/fgf/

Services Provided by the National Weather Service
A. Basic Services
1. Rangeland Fire Danger Forecast - Routine

This product is issued by WFO BIS and covers **all** of North Dakota and is issued daily around 5:00 am CDT during the fire weather season. It is a forecast of the potential for non-agricultural grasslands to carry fire. It is based on the temperature, humidity, wind, sky cover and the estimated "greenness" of the fuel. The highest threat period for the rangeland fire danger is usually before the spring green-up and again in the fall. This product is intended for public use as well as for state and local authorities. The product will be updated if conditions vary significantly from those forecast.

In case of extreme fire weather conditions, the NWS will, upon recommendation of the North Dakota Fire Council via the North Dakota Division of Emergency Management, place selected counties in the "Extreme" category regardless of the daily weather conditions.

See Figure 2 for an example of this product.

2. Daily Pre-Suppression Forecast - Routine
This forecast product is issued twice daily during the fire weather season (730 am and 330 pm). The morning forecast contains a brief weather discussion, forecasts for today, tonight and tomorrow, and a general 3 to 7-day forecast. The afternoon forecast covers the periods of

tonight, tomorrow, tomorrow night, the following day and a general 3 to7-day forecast. The product will be updated as needed. The "Discussion" should be tailored to address items of importance to the fire weather forecast. Persistent errors or biases in the forecast should be brought to the attention of the NWS. The local optional elements may vary from office to office.

The Bismarck morning discussion will contain expected 1 pm transport winds, mixing heights and smoke dispersal (Figure 6) based on the morning Bismarck sounding. The Bismarck optional local elements will be the mid-level Haines index (Figure 3a), LAL (Figure 3b) and Chance of Wetting Rain (CWR >.10 inches). See Figure 4 for examples of these products.

3. Fire Weather Watch/Red Flag Warning (non-routine)

These products are essential to the safety of the fire crews. Because of this, a Fire Weather watch or a Red Flag Warning should be issued even if the event appears to be borderline. Coordination with surrounding offices is desirable. Red flag warnings should be issued any time of the day if conditions warrant.

1) A Fire Weather Watch will be issued whenever the potential for Red Flag conditions are expected in the next 24 to 48 hours.

2) A Red Flag Warning will be issued if the Red Flag criteria, given below, are expected to be met within the next 12 to 24 hours, are imminent or are occurring.

The Red Flag information will be included as a "headline" in the fire weather forecast. It will also be disseminated as a special product (see Figure 8) that is available on the Internet and NOAA Weather Wire. In addition, the North Dakota Inter-agency Dispatch Center will be notified by phone at 701-768-2552 (after hours and on weekends call the duty officer at 701-721-2334).

A Red Flag event is defined as weather conditions which could sustain extensive wildfire activity and meet one or more of the following criteria:

a. Sustained surface winds, or frequent gusts, of 25 mph or higher when the Rangeland Fire Danger rating is "Very High" or "Extreme". In particular, an abrupt change in direction due to the approach and passage of a cold front, or other weather phenomena other than isolated thunderstorms.

b. Unusually hot and dry conditions (RH less than 20 %) when the Rangeland Fire Danger rating is Very High or Extreme.

c. Dry thunderstorm activity is foreseen during an extremely dry period when the Rangeland Fire Danger rating is Very High or Extreme.

d. Anytime the forecaster foresees a change in weather that would result in a significant increase in fire danger (e.g. very strong winds associated with a cold front even though the rangeland fire danger index is below the very high category, extensive lightning).

4. Spot Forecasts (non-routine)

a. Policy

Spot Forecasts will be issued upon request by **any** land management agency (Federal, State, County, etc.).

b. Procedure for Requesting Spot Forecasts

The preferred method to request a spot forecast is via the internet web pages mentioned above (Figure 5b). Requests for Spot forecasts to WFO Bismarck can also be made using WS Form D-1 or equivalent (Figure 5a). Normally, requests/forms should be submitted by fax (701-250-4450). Topographic information and observed weather conditions should be provided when appropriate/available. Phone inquiries should be directed to 701-250-4494. The Spot Forecast will be posted to the web page and can be faxed to the requesting agency upon request. Our goal is to provide a forecast within 30 minutes of the request, however, higher priority duties may occasionally delay the spot forecast. An updated Spot Forecast may be requested if it appears conditions are significantly different than those forecast. Feedback on the utility of the Spot Forecast is requested.

The NWS will strive to provide as much detail as possible in the wind forecast. This includes specific wind shift times, wind gusts, etc.

In addition for Spot Forecast service in eastern North Dakota, call WFO Grand Forks at 701-795-5127.

c. Weather Elements Included in Spot Forecasts

Discussion - A brief synopsis of weather features affecting the area

Sky/Weather, Maximum/Minimum Temperature, Maximum/Minimum RH, 20 foot wind

Optional Elements (BIS) - Haines index, transport wind, mixing depth, LAL, and Chance of wetting rain (>.10 inches). These elements may vary from office to office.

See Figure 7 for an example of a Spot Forecast.

B. Special Services

Incident Response Meteorologist

If a wildfire is, or is expected to be, uncontrollable, and loss of life and/or considerable property damage is a possibility, the land management agency may request an on-site deployment of a trained and certified NWS Incident Meteorologist (IMET). The NWS IMET provides the Incident Command Team with 24-hour on-site fire weather support. The IMET's equipment requires at least 1 phone line, electrical power and a dry shelter at, or near, the command site. To request an IMET deployment, contact the ND Dispatch Center.

Contact Points

National Weather Service:

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robert.turner@noaa.gov

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Operational Services Meteorologist
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Lee Anderson
Meteorologist in Charge
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701-795-5198

Al Voelker
Fire Weather Program Leader
al.voelker@noaa.gov

US Fish & Wildlife Service:

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Huron Wetland Management District
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605-352-6709 - fax
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Andrew L. Randall, Dispatch Center Manager
ND Interagency Dispatch Center
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701-768-2626 - fax
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Vacant, Lead Dispatcher
ND Interagency Dispatch Center

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Bismarck, ND 58503
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msand@fs.fed.us

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701-623-4840 - fax
beth_card@nps.gov

North Dakota Forest Service:
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701-328-9947 - fax

North Dakota Division of Emergency Management:
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Northern Rockies Predictive Services
Steve Stoll
5765 West Broadway Street
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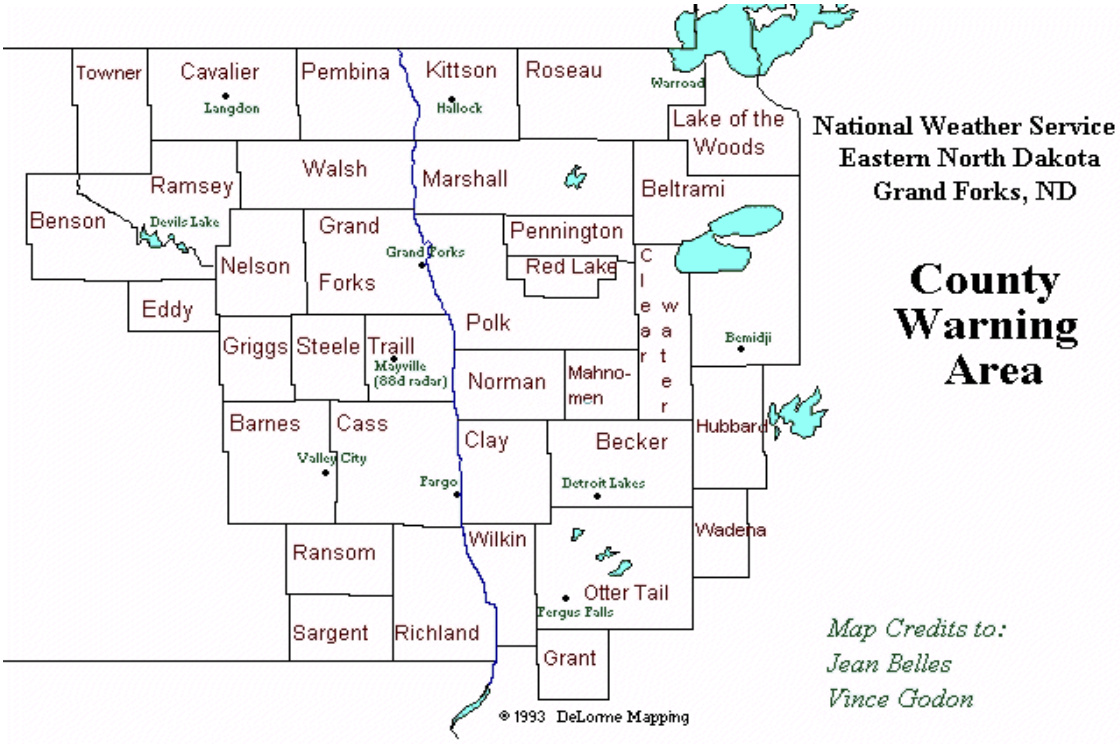
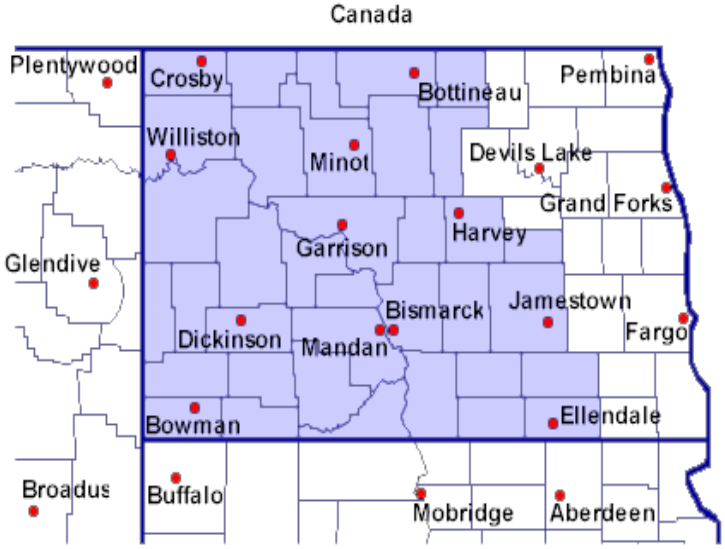
406-329-4703
406-829-6901 - fax
steve_stoll@fws.gov



Fire Weather Zone 135



Fire Weather Zone 134

Figure 1

NORTH DAKOTA RANGELAND FIRE DANGER STATEMENT
NATIONAL WEATHER SERVICE BISMARCK ND
500 AM CDT THU APR 19 2001

...THE RANGELAND FIRE DANGER INDEX WILL REMAIN IN THE LOW CATEGORY STATEWIDE TODAY...

SYNOPSIS...LOW PRESSURE APPROACHING FROM THE WEST AND AN UPPER LEVEL DISTURBANCE WILL BRING SHOWERS TO THE STATE DURING THE NEXT 24 HOURS.

FAR NORTHWEST RURAL FIRE ZONE 1...FIRE INDEX=LOW
...DIVIDE...WILLIAMS...MCKENZIE

FAR SOUTHWEST RURAL FIRE ZONE 2...FIRE INDEX=LOW
...GOLDEN VALLEY...BILLINGS...SLOPE...BOWMAN

SOUTHWEST RURAL FIRE ZONE 3...FIRE INDEX=LOW
...DUNN...STARK...HETTINGER...ADAMS

NORTH CENTRAL RURAL FIRE ZONE 4...FIRE INDEX=LOW
...BURKE...MOUNTRAIL...RENVILLE...WARD...BOTTINEAU...MCHENRY
...ROLETTE...PIERCE

CENTRAL RURAL FIRE ZONE 5...FIRE INDEX=LOW
...MCLEAN...SHERIDAN...MERCER...OLIVER...MORTON...BURLEIGH

SOUTH CENTRAL RURAL FIRE ZONE 6...FIRE INDEX=LOW
...GRANT...EMMONS...SIOUX

NORTHEAST RURAL FIRE ZONE 7...FIRE INDEX=LOW
...TOWNER...CAVALIER...PEMBINA...BENSON...RAMSEY...WALSH...WELLS...EDDY
...FOSTER...NELSON...GRAND FORKS...GRIGGS...STEELE...TRAILL

EAST CENTRAL RURAL FIRE ZONE 8...FIRE INDEX=LOW
...KIDDER...STUTSMAN...BARNES...LOGAN...LAMOURE...MCINTOSH...DICKEY

FAR SOUTHEAST RURAL FIRE ZONE 9...FIRE INDEX=LOW
...CASS...RANSOM...SARGENT...RICHLAND

OUTLOOK FOR TOMORROW...LOW

CONTACT LOCAL FIRE OFFICIALS...THE STATE FIRE MARSHAL OR THE NORTH DAKOTA DIVISION OF EMERGENCY MANAGEMENT FOR INFORMATION ON RESTRICTIONS OR PROHIBITIONS.

27*27*27*21*21*21*22*22*22*

Figure 2

Computing the Haines Index in Middle Terrain Elevations

Stability Term= Temp(850mb) - Temp(700mb)
Moisture Term = Temp(850mb) -Dew Point Temp(850mb)

Each term is given a value of either 1, 2 or 3.
Stability Term Value:
1 – if 5 deg C or less
2 – if 6-10 deg C
3 – if 11 deg C or more

Moisture Term Value:
1 – if 5 deg C or less
2 – if 6-12 deg C
3 – if 13 deg C or more

The Stability and Moisture terms are added to calculate the Haines index.

2 or 3	Potential for large fire...very low
4	...low
5	...moderate
6	...high

Figure 3a

Lightning Activity Level Guide for Weather Observers

		Individual Storm Cell Cloud to Ground Lightning Discharge (cg)		
LAL	**Cloud & Storm Development**	**Counts cg/5 min**	**Counts cg/15 min**	**Avg. cg/min**
1	No T-storms	-	-	-
2	Cumulus clouds are common but only a few reach the towering cumulus stage. A single thunderstorm must be confirmed in the observation area. The clouds produce mainly virga, but light rain will occasionally reach the ground. Lightning is very infrequent.	1-5	1-8	<1
3	Towering cumulus covers less than two-tenths of the sky. Thunderstorms are few, but two to three must occur within the observation area. Light to moderate rain will reach the ground, and lighting is infrequent.	6-10	9-15	1-2
4	Towering cumulus covers two to three-tenths of the sky. Thunderstorms are scattered and more than three must occur within the observation area. Moderate rain is common and lightning is frequent.	11-15	16-25	2-3
5	Towering cumulus and thunderstorms are numerous. They cover more than three-tenths and occasionally obscure the sky. Rain is moderate to heavy and lightning is frequent and intense.	>15	>25	>3
6	Similar to LAL 4 except thunderstorms are dry.			

Figure 3b

FIRE WEATHER FORECAST (MORNING)

NATIONAL WEATHER SERVICE

TIME-DATE

...HEADLINE... (REQUIRED FOR RED FLAG WARNINGS AND FIRE WEATHER WATCHES...SIGNIFICANT FEATURES AT OTHER TIMES RECOMMENDED)

.DISCUSSION...

NDZXXX-XXX>XXX-DDHHMM-

GEOGRAPHICAL DESCRIPTORS

...RED FLAG WARNING/FIRE WEATHER WATCH HEADLINE... (AS NEEDED)

.TODAY...

SKY/WEATHER.....

MAX TEMPERATURE.....

24 HR TREND.....

MIN HUMIDITY.....

24 HR TREND.....

WIND (20 FEET).....

OPTIONAL ELEMENTS...

.TONIGHT...

SKY/WEATHER.....

MIN TEMPERATURE...

24 HR TREND.....

MAX HUMIDITY.....

24 HR TREND.....

WIND (20 FEET).....

OPTIONAL ELEMENTS...

.TOMORROW...

SKY/WEATHER.....

MAX TEMPERATURE...

MIN HUMIDITY.....

WIND (20 FEET).....

OPTIONAL ELEMENTS....

=

$$

[FORECAST FOR NEXT GEOGRAPHICAL DESCRIPTOR AND FIRE WEATHER ZONE GROUP]

=

$$

.FORECAST DAYS 3 THROUGH 7... (WINDS MUST BE INCLUDED DAYS 3-5)

.DAY3... (DAYS CAN BE COMBINED)

.DAY4...

.DAY5...

.DAY6...

.DAY7...

=

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FIRE WEATHER FORECAST (AFTERNOON)

NATIONAL WEATHER SERVICE

TIME-DATE

...HEADLINE... (REQUIRED FOR RED FLAG WARNINGS AND FIRE WEATHER WATCHES...SIGNIFICANT FEATURES AT OTHER TIMES RECOMMENDED)

.DISCUSSION...

NDZXXX-XXX>XXX-DDHHMM-

GEOGRAPHICAL DESCRIPTORS

...RED FLAG WARNING/FIRE WEATHER WATCH HEADLINE... (AS NEEDED)

.TONIGHT...

SKY/WEATHER.....

MIN TEMPERATURE...

24 HR TREND.....

MAX HUMIDITY.....

24 HR TREND.....

WIND (20 FEET).....

OPTIONAL ELEMENTS...

.TOMORROW...

SKY/WEATHER.....

MAX TEMPERATURE...
24 HR TREND.....
MIN HUMIDITY.....
24 HR TREND.....
WIND (20 FEET).....
OPTIONAL ELEMENTS...

.TOMORROW NIGHT...
SKY/WEATHER.....
MIN TEMPERATURE...
MAX HUMIDITY.....
WIND (20 FEET).....
OPTIONAL ELEMENTS...

.FOLLOWING DAY...
SKY/WEATHER.....
MAX TEMPERATURE...
MIN HUMIDITY.....
WIND (20 FEET).....
OPTIONAL ELEMENTS...
=
$$
[FORECAST FOR NEXT GEOGRAPHICAL DESCRIPTOR AND FIRE WEATHER ZONE GROUP]
=
$$
.FORECAST DAYS 3 THROUGH 7... (WINDS MUST BE INCLUDED DAYS 3-5)
.DAY3... (DAYS CAN BE COMBINED)
.DAY4...
.DAY5...
.DAY6...
.DAY7...

=
$$

Figure 4

WS FORM D-1 U.S. DEPARTMENT OF COMMERCE

SPECIAL WEATHER FORECAST REQUEST -

NOAA NATIONAL WEATHER SERVICE

I. REQUESTING AGENCY WILL FURNISH:

1. Time†	2. Date	3. Name of Fire or Project	4. Control Agency	
5. Type of Project Emerging Wildland Fire Ongoing Wildland Fire Mgmt. Ignited Prescribed fire Other_____		6. Location (*S/T/R or LAT/LONG)*	8. Exposure	9. Size (*acres)*
		7. Drainage Name	10. Elevation Top | Bottom	

11. Fuel Type: Grass Brush Timber Slash Grass/Timber Understory Other_____

Fuel Model: 1,2,3 4,5,6,7 8,9,10 11,12,13 2,5,8

12. Location and name of nearest RAWS station (distance & direction from project):

13. Weather Observations from project or nearby station(s):

Place	Elevation	†Ob Time	20 ft. Wind		Eye Level Wind.		Temp.		Moisture		Remarks *(Indicate rain, T'storms, etc. Also wind condition and 10ths of cloud cover)*
			Dir	Speed	Dir	Speed	Dry	Wet	RH	DP	

14. Requested Forecast Period

†Time Date Start

_____ _____

End _____ _____

15. Critical Elements ***(for management ignited wildland fires, provide prescription parameters):***

Sky/Weather **Wind Speed**

Wind Direction _____ **RH**_____

Temperature _____ **Other** ***(specify)*** _____

16. Send Forecast to: ATTN:	Location:	Phone Number: Fax Number:

II. FIRE WEATHER FORECASTER WILL FURNISH:

17. FORECAST AND OUTLOOK

Name of Forecaster:	NWS Office:	Time and Date:

Forecast Confidence: ____High ____Low

III. REQUESTING AGENCY WILL COMPLETE UPON RECEIPT OF FORECAST:

18. FEEDBACK to NWS: Please provide feedback to NWS staff on forecast accuracy etc. (see instructions)

IV. FORECAST RECEIVED:

TIME: **DATE:** **NAME:**

EXPLANATION OF SYMBOLS: **† Use 24-hour clock to indicate time. Example: 10:15 p.m. = 2215; 10:15 a.m. = 1015**

WS FORM D-1, April 2000 INSTRUCTIONS:

I. Fire Control and Other Project Personnel:

1. Complete all items in sections I, III and IV each time a special forecast is requested.

   a. Example of weather conditions on site:

13. Weather Observations from project or nearby station(s):

Place	Elevation	†Ob Time	20 ft. Wind		Eye Level Wind.		Temp.		Moisture		Remarks *(Indicate rain, T'storms, etc. Also wind condition and 10ths of cloud cover)*
			Dir	Speed	Dir	Speed	Dry	Wet	RH	DP	
Unit G-50	1530'	0830	315	6-8	315	3-5	32		72		Observations from unit RAWS station, 50% cloud cover.

2. Transmit in numerical sequence to the appropriate Fire Weather Office. (A weather forecaster on duty will complete the special forecast as quickly as possible and transmit the forecast and outlook to you by the method requested)

   For forecast zones 1-5, 9-13, 17-23, 25, 31-37, 40-48, and 50-51 (western and central North Dakota) submit request to the Bismarck NWS office by fax : (701) 250-4450. Phone inquiries should be directed to (701) 250-4494.

   For forecast zones 6-8, 14-16, 24, 26-30, 38-39, 49 and 52-53 (eastern North Dakota) submit request to the Grand Forks NWS office; FAX: (701) 772-0751. Phone inquiries should be directed to (701) 795-5127

3. Retain completed copy for your records.

4. Provide feedback to NWS utilizing Section III, #18 or separate page. ***Be sure to include a copy of the spot forecast with any feedback submission including forecaster's name. Feedback to NWS personnel is imperative to assist with future forecasts. Remember, feedback on correct forecasts is equally as valuable as feedback on incorrect forecasts!*** If spot forecast is significantly different than conditions on site, a second forecast may be required.

II. ALL RELAY POINTS should use this form to insure completeness of date and forecast. A supply of this form should be kept by each dispatcher and all others who may be relaying requests for forecasts or relaying completed forecasts to field units.

III. Forms are available from your local National Weather Service Fire Weather Forecast Office, at the North Dakota Interagency Dispatch Center (NDC), and on the NDC web page located at http://ndc.fws.gov. They may also be reproduced by forest or range agencies as needed, entering the phone number and radio identification if desired.

IV. Fire Weather Forecasters:

1. Complete special weather forecast as quickly as possible and return forecast and outlook by the method requested. Forecast should include standard forecast information for the period including today, tonight and tomorrow, and specific information as requested in Section II, along with a measure of forecast confidence.

2. Retain copy for record purposes.

3. Read and evaluate feedback based upon original conditions and forecast to assist with accuracy of future forecasts.

Figure 5a

BISMARCK SPOT FORECAST REQUEST

Required Elements in RED

PROJECT NAME

Project Name:

○ Wildfire ○ WFU
◉ Prescribed Fire

Ignition Time: 1610
◉ Central Local Time
○ Mountain Local Time

Date: 2/26/03

REQUESTING AGENCY

Requesting Agency:
Phone Number: Ext.
FAX Number:
Contact Person:

LOCATION

Lat:
Lon:
7.5' Quad:

Elevation: Top Bottom
Drainage:
Aspect:
Size: (Acres)

FUEL

Type:
Sheltering
○ Full
○ Partial
○ Unsheltered

OBSERVATIONS

Place	Elev	Time	Wind	Temp	Wetbulb	RH	Dewpt.	Sky/Weather

PRIMARY FORECAST ELEMENTS

TDA TNT TMR (Today, Tonight, Tomorrow)

- ☐ ☐ ☐ Sky / Weather
- ☐ ☐ ☐ Temperature
- ☐ ☐ ☐ Relative Humidity
- ☐ ☐ ☐ 20 Foot Wind
- ☐ ☐ ☐ Haines Index
- ☐ ☐ ☐ Smoke Dispersion
- ☐ ☐ ☐ LAL
- ☐ ☐ ☐ Chc Wetting Rain

REMARKS

Submit Request | Cancel Request | Clear Form

Figure 5b

Smoke Dispersal Terms

Category	Description
Very Poor	High smoke pollution potential. Usually occurs in a very stable air (strong inversion) and light winds. Normally occurs late at night and early in the morning hours, but could occur during the daytime when a shallow pool of cold air intrudes into the area creating strong low level inversions. Burning is not advised under this category.
Poor	Moderate to High smoke potential. Burning not advised under this category. Most likely time of occurrence is from evening through the early morning.
Fair	Marginal smoke pollution potential. Dependent on trend of weather and local conditions. Generally acceptable for small burns of dry fuels.
Good	Moderate to Low smoke pollution potential. No inversion and gentle winds expected. Most likely to occur in the late morning and afternoon when surface heating usually breaks through the low level inversions.
Very Good	Low smoke pollution potential. Transport winds or mixing height lower than that for Excellent. Transport winds stronger than that for Good. Most likely to occur in the late morning and afternoon.
Excellent	Low smoke pollution potential. Unstable airmass and/or brisk winds. Best time to conduct burning operations if fire can be controlled. Most likely to occur in the late morning and afternoon or when a strong weather system affects the area, eliminating all low level inversions and generating moderate winds.

Breakdown of Ventilation
Based on Mixing Height and Transport Wind

Excellent.....150,000 Knot Feet and Greater
Very Good.....100,000 to 150,000 Knot Feet
Good.....60,000 to 100,000 Knot Feet
Fair.....40,000 to 60,000 Knot Feet
Poor.....Less than 40,000 Knot Feet

Figure 6

SPOT FORECAST FOR
ISSUED BY NATIONAL WEATHER SERVICE
TIME-DATE

VALID UNTIL <12 HOURS FROM ISSUANCE>
IF CONDITIONS BECOME UNREPRESENTATIVE, CONTACT THE NATIONAL WEATHER SERVICE.

...HEADLINE... (REQUIRED IF FIRE WEATHER WATCH/RED FLAG WARNING IN EFFECT)

DISCUSSION...

FIRST PERIOD
SKY/WEATHER.....
TEMPERATURE.....
HUMIDITY.....
WIND (20 FEET).....
OPTIONAL ELEMENTS...

SECOND PERIOD
SKY/WEATHER.....
TEMPERATURE.....
HUMIDITY.....
WIND (20 FEET).....
OPTIONAL ELEMENTS...

THIRD PERIOD
SKY/WEATHER.....
TEMPERATURE.....
HUMIDITY.....
WIND (20 FEET).....
OPTIONAL ELEMENTS...

$$

Figure 7

RED FLAG WARNING

NATIONAL WEATHER SERVICE BISMARCK ND

430 AM CDT SAT OCT 21 2000

NDZ001>005-009>013-017>023-025-031>037-040>048-050-051-212300-

...RED FLAG WARNING HAS BEEN ISSUED FOR STRONG SOUTH WINDS FOR WESTERN AND CENTRAL NORTH DAKOTA THIS AFTERNOON...

DISCUSSION: LOW HUMIDITY...COMBINED WITH SOUTHERLY WINDS GUSTING TO 35 MPH WILL DEVELOP THIS AFTERNOON ACROSS WESTERN AND CENTRAL NORTH DAKOTA.

THE GUSTY WINDS ARE BEING PRODUCED BY A STRONG HIGH PRESSURE SYSTEM OVER THE GREAT LAKES AND A COLD FRONT MOVING TOWARD THE NORTH DAKOTA BORDER FROM CENTRAL MONTANA. THE WINDS WILL SHIFT TO THE NORTHWEST AND DECREASE TO 10 TO 20 MPH BEHIND THE FRONT AS IT PASSES THROUGH WESTERN AND CENTRAL NORTH DAKOTA TONIGHT.

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Figure 8

This AOP is effective for the 2003 Fire Weather Season.

James R. Fors
National Weather Service Bismarck, ND

Lee Anderson
National Weather Service Grand Forks, ND